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AUTHOR Meyer, Jeanie Keeny; Levine, Daniel U.
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ABSTRACT

The relationship between neighborhood characteristics and achievement level was investigated in six metropolitan schools, after accounting for neighborhood type. Neighborhoods were classified into four types: middle socioeconomic status white, low status white, middle status black, and low status black. Additional neighborhood characteristics--density and housing conditions--were also studied to determine their relationship to school achievement, and whether or not such relationships vary in different types of neighborhoods. Reading achievement data were gathered on fifth or sixth graders in six large urban school districts which had been classified according to density of housing; the schools were classified according to neighborhood type. Valid data were not available for middle status black neighborhoods. Four major conclusions were made regarding the correlation between neighborhood and school achievement. (1) High density was related to low achievement in low status neighborhoods. (2) High density was not associated with low achievement in middle status neighborhoods. (3) Housing value of owner-occupied housing was generally related to achievement. (4) Percent of vacant housing units was related to low achievement in four of the six districts. (Author/GDC)

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THE RELATIONSHIP OF DENSITY TO SCHOOL ACHIEVEMENT WITHIN THE CONTEXT OF NEIGHBORHOOD TYPE

Jeanie Keeny Meyer
Daniel U. Levine

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The purpose of this study* was to identify neighborhood characteristics which are associated with achievement level in metropolitan area schools, after account is taken of the type of neighborhood in which schools are located.

Two of the neighborhood characteristics which our own and other previous research suggest are important in relating type of neighborhood in which schools are located to achievement are socioeconomic level and racial composition. Both these dimensions of neighborhood composition figure prominently in most previous typologies of urban neighborhoods in the United States (Shevky and Bell, 1955; Chilton, 1964). Research has indicated that a variety of important social phenomena such as juvenile delinquency, school performance, and unemployment are related to these aspects of neighborhood composition.

Accordingly, this study classified school neighborhoods in six large school districts into four types of neighborhoods: middle status white; low status white; middle status black; and low status black. After typologizing school neighborhoods in this manner it is possible to determine whether additional characteristics of neighborhoods such as density and housing conditions are independently related to school achievement levels and, if so, whether such relationships differ in differing types of neighborhoods. Both density and housing variables were included in the present study in order to determine how they relate to school achievement after taking account of neighborhood type.

EFFECTS OF DENSITY ON SOCIAL BEHAVIOR

Much of the early analysis relating density to social behavior was based on the

*This paper reports the results of one study in a series of studies on the relationship between neighborhood type and school achievement. Preliminary data analysis on three school districts led to conclusions different than those reported in this paper. However, subsequent analysis indicated that the earlier conclusions were not replicated for additional school districts, hence the focus of this paper has been somewhat changed from that of the original proposal.

findings of animal studies indicating that high density led to various kinds of socially-problematic behavior. In particular, Calhoun (1962) conducted studies indicating that high levels of population density among rats frequently produced "pathological" behavior. This type of finding led to widespread acceptance of the belief that high population densities have detrimental effects in human society.

Before long, however, it became clear that such a generalization was much too single-minded: density frequently was not associated with "pathological" or other socially undesirable effects. Schmitt (1963) reported that in Hong Kong, number of people per acre is not consistently associated with social problems, and Winsborough (1965) demonstrated that correlations between density and social pathology frequently disappear after controlling for social status. Findings such as these led social scientists to question the broad generalization that density per se has a deleterious effect on human behavior. Sommer summarized the research before 1966 and the need to take other community characteristics into account in studying the effects of density as follows:

> Experimental studies relating crowding per se to humans are practically nonexistent. This is not to deny that numerous writers have described and even itemized their conceptions of the ill effects of overconcentration and overcrowding. Population density has been related to psychosomatic symptomatology, neurosis, psychosis, juvenile delinquency, alcoholism, alienation, etc. The problem remains that in none of these accounts can crowding legitimately be separated from associated phenomena, including low income, inadequate food, lack of education, social prejudice, etc.

Since about 1966, social scientists have taken a sophisticated view of the relation between density and behavior in human societies, paying a good deal of attention to 1) conditions under which density may have deleterious effects and, 2) the ways in which differing aspects of density may relate to environmental conditions and behaviors. A

number of points of view and previous studies pertinent to our goals in conducting the present study are briefly described below.

Much of the analysis examining the effects of density on social behavior has focused on the distinction between "density" and "crowding." Stokols (1972), for example, defined density in physical terms denoting "a physical condition involving the limitation of space." Crowding, on the other hand, was defined in psychological and socio-psychological terms involving "the restrictive aspects of limited space. . . /as/ perceived by the individuals exposed to them" (p. 75). Stokols pointed out that high density does not necessarily generate stress or other deleterious effects on individuals; instead the tendency for high density to be stressful depends on a variety of physical, social, and personal factors in a given situation.

Lawrence (1974) reviewed the research on crowding and human behavior, and noted that the distinction between density and crowding had become widely accepted, leading to a more judicious view of the problems inherent in high density communities: "Dire prognoses of the horrors of 'overcrowding' are judged to be imprecise and premature" (p. 712). He also concluded that responses to crowding vary a good deal in accordance with the psychological and physiological characteristics of individuals in differing environments.

Morgan (1972) also has distinguished between density and crowding, and has drawn attention to additional complexities in defining these terms and identifying their implications for behavior. Where Stokols and others call attention to the fact that density can be objectively high but may not be perceived as "overcrowding" leading

to stress and pathological behavior, Morgan points out that high density may have damaging effects even if it is not perceived as resulting in overcrowding. He believes that high density may have this effect because it may interfere with fundamental support systems individuals need in order to function well in society:

> Over the past twenty-five years, the author has been studying problems associated with urban densities, and particularly with causes of harm from large city living. It early became apparant that density, rather than crowding was the more harmful variable. Many a villager has much more interpersonal interaction than the average city dweller. An important cause of harm from large city density is its disintegration of small community associations that give individuals healthy social contacts, security, social control, personal identification, and stability of culture (p. 201).

Analysis on the effects of density in human society thus suggest that it is important to be precise in the terminology and concepts used to carry out this type of research. Density should not be equated with crowding, and one cannot assume that high density necessarily generates pathological behavior.

As might be expected given the conclusion that high density may or may not have harmful consequences depending on social, psychological, and other factors, several studies have found that high density has negative effects in some kinds of environments, but not in others. Booth, Welch, and Johnson (1976), for example, found that density is more closely related to crime rates in large than in small cities, perhaps because the "opportunity structure for illegitimate activities provided by area crowding is not so great in smaller" (p. 303) as in large communities. Mitchell (1971) studied relationships between housing density and the attitudes and behaviors of individuals in Hong Kong, and found that density had an independent relationship with indicators of "emotional strain" (worry and unhappiness) only for the poorest members of the community,

apparently because the poor had few ways to overcome or avoid stress that might be attendant on high density. This seemed particularly to be the case among low-status families, for whom urban high population density involved a "doubling up" of families in the same housing unit:

> . . . the doubling up of nonrelated households tends to create stressful situations, especially if it is difficult for the household members to easily escape each other by retreating outdoors. It is more difficult to retreat in this way when the dwelling unit is on an upper floor of a multistory building. Therefore, multistory buildings, when combined with sharing arrangements, can have negative effects on the emotional health of individuals (p. 27).

High density as denoted by multistory buildings provides a particularly useful example of the need to take socioeconomic status into account in examining relationships between density and social phenomena such as delinquency and school achievement. Hall (1966), Amick and Kviz (1975), and other observers have described ways in which crowded living conditions in high-rise buildings for the poor contribute to the development of socially-damaging or pathological attitudes and behaviors. However, high-rise buildings for middle-status families probably have little or no independent relationship with social pathology, probably because there generally is much more space available per person in middle-status than low-status buildings, and because middle-status individuals tend to interact with immediate neighbors less frequently than do low-status individuals.

The preceding discussion suggests that there are many ways to measure density and that the selection of variables for research purposes can have an important bearing on the results. Density can be measured by persons per acre, persons per building, persons

per housing unit, persons per room, buildings per acre, families per housing unit, or in other ways. A number of studies have indicated that one or another measure may be related to some types of social phenomena but not to others. Galle, Gove, and McPherson (1972), for example, found that persons per room was a better predictor of public assistance and juvenile delinquency rates than was housing units per structure; the latter variable, however, was related to delinquency rates but not public assistance rates. Findings of this nature indicate that conclusions regarding the effects of density on social behavior should be stated clearly in terms of the specific measures used to assess the independent and dependent variables.

SAMPLE AND DATA

Census data for each city in the study were taken from books published by the U. S. Bureau of the Census. These books provide tract information which was collected as part of the fourth count of the 1970 Census. Tracts were allocated to schools either according to lists supplied by school district officials or by visual matching of tract and school boundary maps, depending on the city. In order to enhance the reliability of the data, schools serving tracts with less than 1,000 population were eliminated from the study.

Data on grade-level reading achievement were obtained from central office personnel in six large urban school districts: Chicago, Illinois; Cincinnati, Ohio; Cleveland, Ohio; Kansas City, Missouri; St. Louis, Missouri, and Shawnee Mission, Kansas.* For each city, data were obtained and coded for all elementary schools which included grade six and

*The Shawnee Mission School District in the Kansas City Metropolitan Area is a predominently middle-status suburban district.

which reported achievement scores for most of the years included in the data set available for that city. Data analysis reported in the paper used sixth-grade reading achievement means* for the following years:

Chicago	- 1970
Cincinnati	- 1972
Cleveland	- 1974
Kansas City	- 1970
St. Louis	- 1973
Shawnee Mission	- 1971

Variables available to measure density in all six districts were the following: 1) Percent of Occupied Housing Units with 1.51 or More People Per Room; and 2) Percent of Occupied Housing Units with Six or More People. In addition, three variables were used to measure characteristics of the housing stock in each school neighborhood, in order to help determine whether independent relationships exist between density and achievement after controlling for neighborhood type (see below). These three variables were 1) Median Value of Owner Occupied Housing Units; 2) Median Value of Renter Occupied Housing Units; and 3) Percent of Housing Units Vacant.**

Variables used to categorize schools by neighborhood type were 1) Percent of Negroes in the neighborhood population; and 2) Percent of Families Half the Poverty Level or less. Schools in neighborhoods in which eighty percent or more of the population was black and more than two percent of the families were half the poverty

* Achievement scores for Shawnee Mission were not available for the sixth grade, therefore fifth grade scores were used.

** Because some of the relationships between the independent variables (density and housing) and the dependent variable (achievement) were curvilinear, each of the independent variables were used in both logged and untransformed form in the analyses reported below. Correlations in Table 1 are the higher of the two correlations for each independent variable.

level or below were classified as "Low Status Black." Schools in neighborhoods with eighty percent or more black population and less than two percent of families half the poverty or below were classified as "Middle Status Black." Comparable criteria were used to categorize "Low Status White" schools and "Middle Status White" schools, respectively.

RESULTS

Correlations between the density and housing measures and school achievement in the school districts included in the study are shown in Table 1. Data are reported by type of neighborhood but are not shown for schools for which there were fifteen or fewer cases in a given district. The reason for this omission is that we felt fifteen cases were the minimum number needed to uncover a reliable relationship within a neighborhood type. Unfortunately, as shown in Table 1, this procedure left us with no sample representing middle status black neighborhoods.

Major conclusions which we drew from the data in Table 1 are as follows:

1. High density as measured by the variable 1.5 or more persons per room is associated with low achievement in low status white and black neighborhoods. Density measured by this variable is not consistently related to achievement in high status white neighborhoods: strong relationships are present in Chicago, Cincinnati, and Kansas City, but relationships in Cleveland and St. Louis were not significant and the relationship in Shawnee Mission was barely significant at the .05 level. This latter pattern agrees partially with previous research which has suggested that density may have deleterious effects in low status but not high status neighborhoods.

2. High density as measured by the variable six or more people per housing unit is associated with low achievement in low status neighborhoods but not middle status neighborhoods. As shown in Table 1, none of the correlations in middle status neighborhoods are statistically significant, while all of the correlations in low status neighborhoods, whether white or black, are significant at the .05 level. This finding is in full agreement with previous research indicating that density has deleterious effects in low status but not middle status neighborhoods.

3. Median housing value measured with reference to owner occupied housing units is related to achievement in a fairly consistent pattern. The only exceptions to this pattern are for middle-status white neighborhoods in Cincinnati and low status white neighborhoods in Cleveland. Median housing value measured with reference to renter occupied housing units is consistently related to achievement in black neighborhoods but is not related to achievement in middle-status white neighborhoods in Cincinnati and St. Louis and in low-status white neighborhoods in Cleveland.

4. Percent of housing units vacant is related to school achievement within neighborhood groupings in four of the six school districts included in the study. Only in St. Louis and Shawnee Mission is there no clear relationship between housing vacancies and school achievement.*

The findings reported above indicate that both density and housing

* One reason why percent of housing vacancies was not associated with achievement in low status black neighborhoods in St. Louis may be because these neighborhoods had very high vacancy rates with little dispersion. As shown in Appendix Table A.1, the vacancy rate here was the highest in the study, and the standard deviation was relatively small. (This type of reason does not appear to account for other findings in this study.)

characteristics of school neighborhoods are generally related to achievement levels after account is taken of neighborhood type. With the exception of the six or more persons per housing unit measure of density in middle-status white neighborhoods, all of the density and housing variables are correlated with achievement in at least half of the district-groupings within the three types of neighborhoods included in the study.

One of the major questions suggested by these findings is whether density and housing characteristics of neighborhoods are independently related to achievement. The two housing value variables, for one thing, can be considered socioeconomic status variables inasmuch as housing value frequently is considered to be an indicator of social status. Thus it is possible that these variables are introducing socioeconomic status considerations over and beyond our poverty measure rather than characteristics of neighborhood housing stock per se. In addition, there is the issue of whether density adds to the prediction of achievement within the context of neighborhood type after account is taken of housing characteristics.

To explore these questions, we conducted a series of multiple regression analyses using forced-order entry of variables in accordance with the hypotheses that housing vacancy and density variables add independently to the prediction of achievement levels within the context of neighborhood type. The results are shown in Table 2.

As indicated in Table 2, there is reason to believe that both density and housing characteristics are independently related to achievement after accounting for socio-economic status and racial composition. As regards housing, the housing vacancy variable improves the prediction of achievement in seven of the fourteen regression runs in which it was entered after the housing value variables. As regards density, our density variables improved the prediction of achievement in six of the fourteen regression

runs in which they were entered following the housing variables, including four sizable increases in variance explained of ten percentage points or more. (In all but one of these six cases it was the people per room variable rather than the people per unit measure which accounted for significant gains in variance explained.) As one would expect in view of our earlier finding to the effect that density is related to achievement in low but not middle status neighborhoods, five of the six runs in which density improved prediction after controlling for housing characteristics were in low status neighborhoods.

DISCUSSION

The analysis of data in this study supports the conclusion that density of population in school neighborhoods is independently related to achievement in low status but not middle status neighborhoods. This pattern is particularly evident when density is measured by number of people per housing unit but it also tends to be present when density is measured by the variable 1.5 or more persons per room. The conclusion is in line with some previous analysis and research suggesting that middle-status families are in a better position than low-status families to adapt to or overcome potentially deleterious social effects associated with high population densities.

It should be emphasized that conclusions in a study of this type can be affected by the choice of variables selected to measure the phenomena being studied. For example, the selection of a particular density measure and of control variables involving socio-economic status and housing characteristics can influence the conclusions of the study. Even the cut-off points used in defining a variable can have important repercussions.*

*As one example, other studies we have conducted indicate that the variable "Percent of housing units with 1.5 or more people per room" is a significantly better predictor of achievement in large school districts than is the variable "Percent of housing units with 1 or more people per room."

Partly for this reason, the results of this study should be treated cautiously, and efforts should be made to explore the issues from a variety of vantage points with a variety of data. In the present case, additional analysis we have been carrying out with our basic data set has been supportive of the conclusion reported above. For example, we have re-analyzed our Chicago and Shawnee Mission data using a figure of one percent rather than two percent of families half or more below the poverty level to distinguish between middle and low status neighborhoods, in order to determine whether our people per room measure of density is related to achievement using this more stringent definition of middle status. (Chicago and Shawnee Mission are the only two of the six districts which have enough middle status neighborhoods by this definition to allow for statistical analysis.) The results indicated that the correlations between people per room and achievement were .06 (p=NS) for 11 middle-status white neighborhoods in Chicago and .28 (p=NS) for 19 middle-status white neighborhoods in Shawnee Mission.

The issues we have explored in this paper are related to some we have examined in previous studies on the relationships between neighborhood characteristics and achievement in large urban school districts. In a previous study, we found that there was a very definite relationship between density and achievement: whenever the percentage of housing units with 1.5 or more people per room in a school neighborhood exceeded three to eight percent (depending on the city), reading achievement scores at the school serving the neighborhood almost always were in the bottom part of the achievement distribution for the school district (Levine et al., 1977).

However, we could not say that high density was a cause of low achievement in these schools because we also found that other correlated indicators of poverty status

(e.g., percent of adults unemployed, percent of females separated or divorced) similarly demarcated neighborhoods which had low achievement and very high density. We concluded that neighborhoods in which the density "threshold" associated with consistently low achievement had been passed were "concentrated poverty" neighborhoods with a variety of social problems. The present study extends our previous research by providing evidence that density probably is independently related to school achievement levels in low status neighborhoods in large metropolitan areas.

The study reported herein also introduced housing characteristics as a determinant of achievement level in large urban school districts. The data in Table 2 indicate that housing characteristics frequently share variance with density in predicting achievement, and analysis not reported in this paper shows that housing characteristics independently contribute to achievement predictions after accounting for neighborhood type and density. This does not mean, of course, that living in a modest house "causes" children to perform poorly in school, any more than our data demonstrate that living in a crowded housing unit is necessarily a direct cause of low achievement. What our data do suggest is that living in neighborhoods with low value housing, high vacancy rates, or high density, is associated with relatively low achievement in the schools, even after taking account of socioeconomic status and race. What it is about such neighborhoods which produces low achievement in the schools is a question for subsequent research.

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Table 1

Correlations Between Neighborhood Variables and School Achievement, By School District and Type of Neighborhood

School District and Type of Neighborhood	(N)	Variable: Percent of Housing Units with 1.5 or More People per Room	Percent of Housing Units with 6.0 or More People	Median Value of Owner Occupied Housing Units	Median Value of Renter Occupied Housing Units	Percent of Housing Units Vacant
Chicago						
Middle status white	(79)	-.46 (.001) *	-.02 (NS)	.56 (.001)	.49 (.001)	-.35 (.001)
Low status white	(32)	-.41 (.01)	-.28 (.05)	.67 (.001)	.72 (.001)	-.52 (.01)
Middle status black	(5)	———	———	———	———	———
Low status black	(58)	-.59 (.001)	-.43 (.001)	.27 (.05)	.47 (.001)	-.48 (.001)
Cincinnati						
Middle status white	(17)	-.74 (.001)	-.34 (NS)	.32 (NS)	.24 (NS)	-.52 (.05)
Low status white	(17)	-.88 (.001)	-.42 (.05)	.67 (.01)	.74 (.001)	-.85 (.001)
Cleveland						
Middle status white	(19)	-.22 (NS)	.33 (NS)	.76 (.001)	.61 (.01)	-.52 (.01)
Low status white	(32)	-.55 (.001)	-.35 (.05)	.27 (NS)	.23 (NS)	-.40 (.01)
Middle status black	(3)	———	———	———	———	———
Low status black	(36)	-.58 (.001)	-.36 (.01)	.54 (.001)	.41 (.01)	-.54 (.01)
Kansas City						
Middle status white	(15)	-.71 (.01)	.29 (NS)	.70 (.01)	.66 (.01)	-.75 (.01)
Low status white	(21)	-.80 (.001)	-.48 (.05)	.64 (.001)	.79 (.001)	-.48 (.05)
St. Louis						
Middle status white	(16)	.35 (NS)	-.36 (NS)	.44 (.05)	.08 (NS)	-.03 (NS)
Low status white	(15)	-.64 (.01)	-.56 (.05)	.52 (.05)	.48 (.05)	-.46 (.05)
Middle status black	(0)	———	———	———	———	———
Low status black	(23)	-.41 (.05)	.25 (NS)	.48 (.01)	.43 (.05)	-.30 (NS)
Shawnee Mission						
Middle status white	(38)	-.33 (.05)	-.13 (NS)	.43 (.01)	.47 (.001)	-.22 (NS)
Low status white	(6)	———	———	———	———	———

*Figures in parentheses in the body of the table indicate significance levels for the correlations. NS = not significant at the .05 level.

Table 2

Variance In Achievement Accounted for by Housing and Density Variables Within the Context of Neighborhood Type *

School District and Type of Neighborhood	(N)	Type of Analysis			
		Variance Explained by Three Housing Value Variables	Variance Added by Density Variables	Variance Explained by Two Housing Value Variables	Variance Added by Housing Vacancy Variable
Chicago					
Middle status white	(79)	.32	NS	.32	NS
Low status white	(32)	.63	NS	.52	.11
Middle status black	(5)	———	———	———	———
Low status black	(58)	.31	.08	.22	.09
Cincinnati					
Middle status white	(17)	.51	.06	.30	.21
Low status white	(17)	.78	.10	.52	.26
Cleveland					
Middle status white	(19)	.61	NS	.61	NS
Low status white	(32)	.17	.19	.05	.12
Middle status black	(3)	———	———	———	———
Low status black	(36)	.37	.11	.29	.12
Kansas City					
Middle status white	(15)	.56	NS	.49	.07
Low status white	(21)	.62	NS	.62	NS
St. Louis					
Middle status white	(16)	.20	NS	.20	NS
Low status white	(15)	.27	.12	.27	NS
Middle status black	(0)	———	———	———	———
Low status black	(23)	.23	NS	.23	NS
Shawnee Mission					
Middle status white	(38)	.26	NS	.26	NS
Low status white	(6)	———	———	———	———

*Variance figures reported in the table are for sets of variables which had statistically significant squared multiple correlations or, as appropriate, accounted for statistically significant increases in squared multiple correlations in forced-order multiple regression analysis. NS = not significant.

Table A.1.

Means and Standard Deviations for Variables Included in the Study, by School District and Type of Neighborhood *

School District and Type of Neighborhood	(N)	Variable: Percent of Housing Units with 1.5 or More People per Room	Percent of Housing Units with 6.0 or More People	Median Value of Owner Occupied Housing Units	Median Value of Renter Occupied Housing Units	Percent of Housing Units Vacant
Chicago						
Middle status white	(79)	.8 (.5)	7.9 (3.2)	23,249 (5505)	121 (26)	2.3 (1.5)
Low status white	(32)	1.2 (1.3)	7.2 (3.4)	19,391 (3910)	101 (22)	4.5 (4.1)
Middle status black	(5)	———	———	———	———	———
Low status black	(58)	5.0 (3.5)	17.5 (8.9)	17,287 (4212)	108 (19)	7.2 (4.9)
Cincinnati						
Middle status white	(17)	.9 (.8)	8.7 (2.5)	18,017 (3863)	97 (15)	3.2 (1.6)
Low status white	(17)	5.5 (4.2)	11.4 (5.2)	11,644 (4320)	74 (19)	8.6 (4.4)
Cleveland						
Middle status white	(19)	.5 (.4)	8.2 (2.6)	17,520 (3288)	94 (15)	3.1 (1.8)
Low status white	(32)	1.2 (.7)	10.4 (3.3)	13,307 (3352)	78 (14)	5.5 (2.6)
Middle status black	(3)	———	———	———	———	———
Low status black	(36)	2.1 (1.3)	15.1 (5.3)	13,149 (2602)	77 (10)	8.0 (5.8)
Kansas City						
Middle status white	(15)	.5 (.5)	5.6 (2.4)	15,986 (6825)	123 (37)	3.3 (2.1)
Low status white	(21)	1.7 (1.5)	8.2 (4.7)	10,287 (2273)	75 (20)	8.9 (6.1)
St. Louis						
Middle status white	(16)	2.4 (3.7)	7.5 (2.9)	14,471 (2957)	81 (13)	3.9 (5.3)
Low status white	(15)	3.5 (2.1)	8.2 (2.6)	10,439 (2541)	65 (10)	8.9 (5.6)
Middle status black	(0)	———	———	———	———	———
Low status black	(23)	8.1 (2.2)	16.7 (3.7)	9,459 (2048)	59 (10)	10.2 (5.9)
Shawnee Mission						
Middle status white	(38)	.4 (.3)	8.8 (3.1)	23,501 (8306)	166 (37)	4.0 (4.2)
Low status white	(6)	———	———	———	———	———

*Achievement data are not included by agreement with school district officials who provided data for the study. Standard deviations are shown in parentheses.